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Health Outcomes of COVID-19 ICU Survivors: A Review Article

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Abstract
Introduction: The COVID-19 pandemic has led to a significant number of patients requiring ICU admission. Survivors of COVID-19 who have been treated in the ICU may experience a decrease in their quality of life (QOL) due to physical, psychological, and social consequences. This review study aims to evaluate the QOL of ICU survivors of the COVID-19 pandemic.
Methods: To conduct this review, a systematic literature search was performed using the PubMed, Scopus, and Cochrane Library databases. Studies published between January 2020 and July 2023 were included in this review. The search strategy included keywords such as COVID-19, Intensive Care Units, Survivors, Quality of Life, Outcome Measures.
Results: The initial search identified 113 studies, of which 16 met the inclusion criteria and were included in this review. The QOL of ICU survivors of the COVID-19 pandemic was found to be significantly lower than that of the general population, with physical, psychological, and social impairments being the most commonly reported consequences. The use of rehabilitation interventions, such as early mobility and exercise, were found to improve QOL in ICU survivors of the COVID-19 pandemic.
Conclusion: COVID-19 patients who require hospitalization and ICU admission may experience short-term and long-term physical, cognitive, emotional, and societal complications and effects after hospital discharge. These complications can significantly impact the patients' health-related quality of life, physical functioning, and psychological well-being.
Keywords: Quality of Life; ICU Survivors; COVID-19; Outcome

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Introduction

The COVID-19 pandemic has had significant clinical, economic, and social effects on many healthcare systems and countries worldwide (1-3). The disease has resulted in a range of clinical consequences, from mild to severe, in many patients, with a large number of patients requiring hospitalization in specialized ICU units and continuous and intensive healthcare services (4-8). Unfortunately, many fatalities have occurred among patients hospitalized in ICU units. The mortality rate among these patients is very high (9-11). Given the severity and prevalence of the disease, many hospitals have faced a shortage of specialized ICU beds, which has put a significant burden on healthcare systems (8, 12). Many recovered patients also suffer from various mental and physical consequences after discharge from the hospital, and these effects have had a significant impact on their lives, especially those who were treated in specialized ICU units under severe conditions(13-16).Now that the pandemic has somewhat subsided and reached a stable state, the fundamental question is what is the current status of recovered patients who were discharged from ICU units, given the severity of the disease, and what clinical consequences and effects are being imposed on them and society(1, 3). It seems necessary to investigate the short- and long-term consequences of the disease on recovered patients to reduce the burden of the disease (17, 18) and draw lessons for the future to reduce the significant costs that healthcare systems and countries have incurred during this pandemic (2). Therefore, this study aims to investigate the quality of life of recovered patients from COVID-19 who were hospitalized in ICU units, using a comprehensive review of articles published worldwide.

Methods

To achieve the specific objective of investigating the quality of life of COVID-19 patients discharged from ICU units, and given the diversity and breadth of research in this area across various databases, the researcher used a systematic search strategy to limit the studies to those relevant to the research objective. Here are the keywords related to the research topic used in different databases: COVID-19, Intensive Care Units, Survivors, Quality of Life, and Patient Reported Outcome Measures Based on the keywords related to the research topic, the researcher used a systematic search strategy across different databases, and the search results are presented in Table 1.

Results

Due to the diversity and breadth of the articles extracted from various databases, the researcher conducted a systematic and organized screening process to achieve the research objective. The screening process is shown in Figure 1, and out of 113 articles, 16 articles met the inclusion criteria for the study. Investigating the findings of various studies has demonstrated that patients experience short-term and long-term complications and effects after hospital discharge. These complications can be categorized into different classifications, including mental, psychological, physical, and other disorders.

Discussion

Some studies examine the health-related quality of life (HRQoL) and pulmonary function of COVID-19 ARDS survivors after ICU discharge. The studies found that HRQoL was significantly lower in both physical and mental dimensions, and persistent dyspnea was often reported. Factors influencing HRQoL trajectories included gender, duration of IMV, and number of comorbidities. Also the studies found that pulmonary structural abnormalities and functional impairment were highly prevalent in COVID-19 ARDS patients who required ICU stay, three months after hospital discharge. They recommend pulmonary evaluation for critical COVID-19 survivors three months after discharge. The follow-up included questionnaires, PFTs, exercise tests, and chest CT imaging. Age and length of invasive mechanical ventilation during the ICU stay were factors associated with the severity of lung damage on chest CT scan (16, 19, 20). Several studies have been conducted on patients who contracted COVID-19 and required hospitalization. One study found that at hospital discharge, over 70% of patients had significant impairment of their mobility and ability to conduct their usual activities. Furthermore, many patients were older than 60 years, suffered from weight loss, and were at high risk of malnutrition and sarcopenia. The study highlights the need for guidelines and systematic protocols, along with appropriate rehabilitation programs, to optimize the nutritional management of COVID-19 survivors after discharge (21). Another study found that 50% of COVID-19 ICU survivors experienced psychological complaints or sleeping disorders, and 19% experienced a reduced quality of life four months after admission. This study emphasizes the importance of addressing these issues in the long term to improve patients' overall well-being and quality of life (22). Additionally, a study explored the relationship between depression levels and the interval between ICU admission and tracheal tube removal. The results showed increased levels of depression and anxiety at follow-up, and a significant relationship between resuming daily life activities, high cognitive

reserve, and executive functions. The study concludes that psychological support is important in the long term, and cognitive reserve plays a modulating role in quality of life after COVID-19 infection (23). Overall, these studies highlight the need for comprehensive care for COVID-19 survivors after hospital discharge. This care should include attention to physical rehabilitation, nutritional management, and psychological support to address the various health issues that may arise after COVID-19 hospitalization. While the study compared the level of anxiety, depression, post-traumatic stress, and quality of life in Intensive Care Unit (ICU) survivors between Covid-19 and Non-Covid-19 patients in an Italian adult 8-bed ICU. The results showed that depression symptoms were observed more among Non-Covid-19 patients compared to Covid-19 patients at six months and 12 months after ICU discharge. The quality of life perceived by the ICU patients surveyed improved between 6 and 12 months after discharge. Covid-19 patients had a better perception of quality of life at six months after ICU discharge than Non-Covid-19 patients. The study concludes that within one year from the acute infection, most hospital survivors of Covid-19 had good physical and functional recovery over time with better outcomes than other ICU patients and had returned to their original work and life (15). Other studies were conducted on COVID-19 ARDS survivors after ICU discharge. A study found that functional disability was observed in about 60% of survivors four months after ICU discharge. Cognitive impairment, muscle weakness, and psychological symptoms were frequent. Rehabilitation was required for 74% of patients, and the use of alpha-2 agonists during ICU stay was associated with a favorable outcome. A large multicenter study is needed to identify modifiable factors for improving long-term outcome (17). Another study showed that only 13% of patients had a symptom-free recovery eight weeks after hospital admission. Besides physical symptoms, memory problems were frequently seen, and a correlation was found between the number of physical symptoms and mental health scores (24). Also a study found that only 32% and 52% of questionnaire responders had a normal quality of life in terms of the physical and mental components, respectively, six months after ICU discharge. Low-molecular-weight heparin treatment in the ICU was a predictor of improved physical component of QoL, while age, female sex, and medical history of cerebrovascular insufficiency were associated with a decrease in physical and mental components of QoL. Body mass index ≥27.6 kg/m (2) was associated with an increase in the mental health component (25). Together, these studies underscore the importance of recognizing the significant physical, cognitive, emotional, and societal impact of COVID-19. Patients with comorbidities, lower income, and higher education levels may be at higher risk of PTSD symptoms and lower quality of life. Healthcare systems need to be prepared to provide care for a large number of critically ill patients after discharge. Societies must address ethical questions and consider how to protect and support vulnerable citizens in light of the pandemic. Ongoing research is needed to identify factors that influence the quality of life of patients discharged from the ICU (26, 27). The purpose of providing an overview of these articles is to provide an insight into the recovery journey of COVID-19 patients post-critical illness. On this way one study found that invasively ventilated COVID-19 ARDS survivors had an overall good recovery at a 2-month follow-up, which was better than what was previously reported in non-COVID-19 ARDS patients (28). Another study described the long-term functioning of patients who survived COVID-19-related ICU admission and found that physical impairments impacted survivors, and family members' well-being was strongly affected by the health of the patient (29). A third study explored the psychological experiences of COVID-19 survivors with severe complications during and after ICU hospitalization, and the prevalence of long-COVID. The study found that long-COVID is an essential problem to manage to improve patients' quality of life. Finally, the Society of Critical Care Medicine coined the term "post intensive care syndrome" (PICS) to describe the prolonged adverse health effects after a critical illness. Evidence from Australia shows that critical illness can have a significant impact on disability, mental health, cognitive function, and health-related quality of life for patients. Research is necessary to explore important aspects of recovery and long-term outcomes for New Zealand survivors of critical illness (30, 31).

Conclusions

COVID-19 patients who require hospitalization and ICU admission can experienced short-term and long-term physical, cognitive, emotional, and societal complications and effects after hospital discharge. These complications can significantly impact the patients' health-related quality of life, physical functioning, and psychological well-being. The studies recommend comprehensive care, including physical rehabilitation, nutritional management, and psychological support, to address the various health issues that may arise after

COVID-19 hospitalization. Further research is necessary to explore important aspects of recovery and long-term outcomes for COVID-19 survivors of critical illness.

Conflict of interest

The author declares that there is no conflict of interests

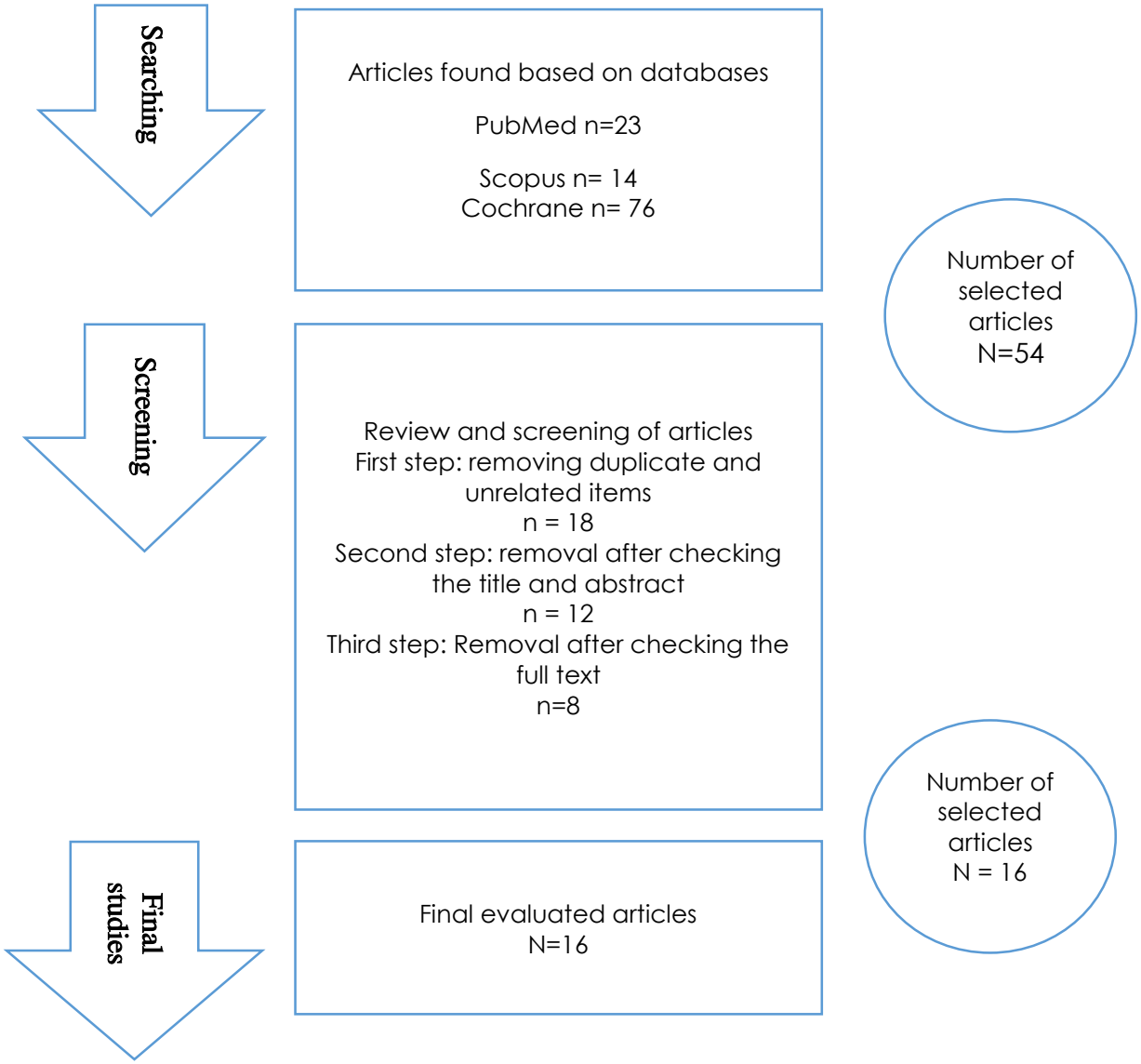

Figure 1. Flowchart of study selection process

Reference

[1] Kaye, Alan D., et al. "Economic impact of COVID-19 pandemic on healthcare facilities and systems: International perspectives." Best Practice & Research Clinical Anaesthesiology 35.3 (2021): 293-306.

[2] Tarricone, Rosanna, and Carla Rognoni. "What can health systems learn from COVID-19?." European Heart Journal Supplements 22.Supplement_P (2020): P4-P8.

[3] Haldane, Victoria, et al. "Health systems resilience in managing the COVID-19 pandemic: lessons from 28 countries." Nature Medicine 27.6 (2021): 964-980.

[4] Musheyev, Benjamin, et al. "Characterizing non-critically ill COVID-19 survivors with and without in-hospital rehabilitation." Scientific reports 11.1 (2021): 21039.

[5] Heesakkers, Hidde, et al. "Mental health symptoms in family members of COVID-19 ICU survivors 3 and 12 months after ICU admission: a multicentre prospective cohort study." Intensive Care Medicine 48.3 (2022): 322-331.

[6] Sheehy, Lisa Mary. "Considerations for postacute rehabilitation for survivors of COVID-19." JMIR public health and surveillance 6.2 (2020): e19462.

[7] Monti, Laura, et al. "COVID-19 pandemic in the intensive care unit: Psychological implications and interventions, a systematic review." World Journal of Psychiatry 13.4 (2023): 191.

[8] Hayati, Hadi. "Pharmacotherapy analysis for hospitalized patients with COVID-19 (prescriptions, costs and outcomes)." Iranian Red Crescent Medical Journal (2023).

[9] Nyasulu, Peter S., et al. "Clinical characteristics associated with mortality of COVID-19 patients admitted to an intensive care unit of a tertiary hospital in South Africa." PloS one 17.12 (2022): e0279565.

[10] Kompaniyets, Lyudmyla, et al. "Body mass index and risk for COVID-19–related hospitalization, intensive care unit admission, invasive mechanical ventilation, and death—United States, March–December 2020." Morbidity and Mortality Weekly Report 70.10 (2021): 355.

[11] Allenbach, Yves, et al. "Development of a multivariate prediction model of intensive care unit transfer or death: A French prospective cohort study of hospitalized COVID-19 patients." PloS one 15.10 (2020): e0240711.

[12] Covino, Marcello, et al. "Predicting intensive care unit admission and death for COVID-19 patients in the emergency department using early warning scores." Resuscitation 156 (2020): 84-91.

[13] Vlake, Johan H., et al. "Effect of intensive care unit-specific virtual reality (ICU-VR) to improve psychological well-being and quality of life in COVID-19 ICU survivors: a study protocol for a multicentre, randomized controlled trial." Trials 22.1 (2021): 1-12.

[14] Turan, Zeynep, Mahir Topaloglu, and Ozden Ozyemisci Taskiran. "Is tele-rehabilitation superior to home exercise program in COVID-19 survivors following discharge from intensive care unit?-a study protocol of a randomized controlled trial." Physiotherapy Research International 26.4 (2021): e1920.

[15] Damico, V., et al. "Long-term consequences in Covid-19 and Non-Covid-19 patients survivors of critical illness. A descriptive study." Annali di Igiene, Medicina Preventiva e di Comunita 35.4 (2023).

[16] Gamberini, Lorenzo, et al. "Quality of life of COVID-19 critically ill survivors after ICU discharge: 90 days follow-up." Quality of Life Research 30 (2021): 2805-2817.

[17] Jiang, David H., and Rozalina G. McCoy. "Planning for the post-COVID syndrome: how payers can mitigate long-term complications of the pandemic." Journal of general internal medicine 35 (2020): 3036-3039.

[18] Mitrani, Raul D., Nitika Dabas, and Jeffrey J. Goldberger. "COVID-19 cardiac injury: Implications for long-term surveillance and outcomes in survivors." Heart rhythm 17.11 (2020): 1984-1990.

[19] Gamberini, Lorenzo, et al. "Health-related quality of life profiles, trajectories, persistent symptoms and pulmonary function one year after ICU discharge in invasively ventilated COVID-19 patients, a prospective follow-up study." Respiratory medicine 189 (2021): 106665.

[20] González, Jessica, et al. "Pulmonary function and radiologic features in survivors of critical COVID-19: a 3-month

prospective cohort." Chest 160.1 (2021): 187-198.
[21] Cuerda, Cristina, et al. "Impact of COVID-19 in nutritional and functional status of survivors admitted in intensive care units during the first outbreak. Preliminary results of the NUTRICOVID study." Clinical Nutrition 41.12 (2022): 2934-2939.
[22] Berends, K., et al. "Experiences of COVID-ICU-survivors: mixed-methods study of psychological consequences by written survey." Tijdschrift voor Psychiatrie 63.5 (2021): 324-330.
[23] De Tanti, Antonio, et al. "Cognitive and psychological outcomes and follow-up in severely affected COVID-19 survivors admitted to a rehabilitation hospital." Neurological Sciences 44.5 (2023): 1481-1489.
[24] Keijsers, Karen, et al. "Memory impairment and concentration problems in COVID-19 survivors 8 weeks after non-ICU hospitalization: A retrospective cohort study." Journal of Medical Virology 94.9 (2022): 4512-4517.
[25] Likhvantsev, Valery, et al. "Six-month quality of life in COVID-19 intensive care unit survivors." Journal of Cardiothoracic and Vascular Anesthesia 36.7 (2022): 1949-1955.
[26] Miori, Sara, et al. "Incidence, risk factors, and consequences of post-traumatic stress disorder symptoms in survivors of COVID-19-related ARDS." International journal of environmental research and public health 20.8 (2023): 5504.
[27] Misak, Cheryl. "Life after the storm: Surviving COVID-19." Perspectives in Biology and Medicine 63.3 (2020): 494-501.
[28] Monti, Giacomo, et al. "Two-months quality of life of COVID-19 invasively ventilated survivors; an Italian single-center study." Acta Anaesthesiologica Scandinavica 65.7 (2021): 912-920.
[29] Onrust, Marisa, et al. "Physical, social, mental and spiritual functioning of COVID-19 intensive care unit-survivors and their family members one year after intensive care unit-discharge: A prospective cohort study." Intensive and Critical Care Nursing 75 (2023): 103366.
[30] Piras, Ilenia, et al. "Experiences, emotions, and health consequences among COVID-19 survivors after intensive care unit hospitalization." International journal of environmental research and public health 19.10 (2022): 6263.
[31] Sutton-Smith, Lynsey, et al. "What are the long-term outcomes for New Zealand survivors of critical illness?." The New Zealand Medical Journal (Online) 134.1547 (2021): 121-126.